PETROGRAPHY.[1]

The Eruptive Rocks of the Christiana Region.—Brögger[2] has done an excellent piece of work in this, the first of his reports on the eruptive rocks of Norway. The article deserves much more notice than can be given it in this place. Briefly, the author describes grorudite, salvsbergite and tinguite dykes which together form what is denominated a rock series—that is, a series of rocks that differ slightly from each other in their chemical composition, but which, at the same time, by their intimate gradations into each other, give evidence of being closely related. All of these rocks are rich in soda and potassa, and all contain alkaline amphiboloids. The grorudite is essentially an aggregate of microcline and albite, usually in microperthitic intergrowths, rarely anorthoclase, and always aegerine and amphibole, as phenocysts, in a groundmass of potash feldspar, albite, sometimes soda-orthoclase, aegerine and more or less quartz. The amphiboles are arfvedsonite and katoforite, the latter name being given to a series of alkaline iron amphiboles having the angle $C \wedge c = 31°$–$58°$, and pleochroism as follows: $B > C > A$ = yellowish red > brownish red > yellowish red or greenish yellow. In all their properties, so far as studied, they occupy a position between barkevikite and arfvedsonite. Salvsbergite differs from grorudite in containing little or no quartz. Its structure is trachytic.

Grorudite is regarded as the dyke form of soda-granite and pantellerite and salvsbergite that of nordmarkite.

After a discussion of the significance of the notion of dyke rocks as a group of well-defined rock types, the author concludes that while the group is well characterized by Rosenbusch, it includes a number of rocks that are but apophyses of bosses, etc., and which should be classed with the rocks of bosses. He prefers the term "hypabyssische Gesteine" for all rocks with the structure of dyke rocks, whether they be in the form of true dykes, of sheets, or whether they occur as the peripheral form of bosses or laccolites. The hypabyssmal rocks comprise a great group of equal value with that of the surface (volcanic) rocks and that of the abyssmal (plutonic) rocks. It includes two classes—the aschistic and the diaschistic—the first embracing those rocks not produced by the differentiation of their source-magma, and the latter

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Viedenskabsselskabels Skrifter. Math.-naturv. Klasse, 1894, No. 4.

those thus produced. The diaschistic rocks form complementary members, such as the minettes and aplites. The complementary form of salvsbergite is lindoite, a trachytic aggregate of phenocysts of microperthite and brown biotite, in a groundmass of quartz, biotite, aegerine and various secondary products, among which carbonates play an important *rôle.*

The laws of differentation in the different parts of the dykes are studied through the aid of a large number of carefully made analyses, as well as those governing the differentiation of the dyke masses from the boss masses. In all cases it is found that the differentiation consists in an increase in Fe_2O_3 toward the sides of the dyke, and an increase of the same constituents in the dyke masses as compared with the coroesponding boss material. The original magma is believed to have split into two magmas, one of which yielded the laccolite and boss material, and the other the substance of the diaschistic dykes. The former, in turn, split in the same way into a peripheral and a main phase, the former of which gave rise to the aschistic dykes.

The large number of analyses accompanying the discussion, and the careful description on which it is based, supply an excellent basis on which the long-desired genetic and philosophical classification of rocks may be founded, provided the lines of thought developed by the author are found to hold for other regions than those of southern Norway.

The Massive Rocks of Arran.—A very full account of the petrographical features of the massive rocks of the southern half of the Island of Arran has been given by Corstorphine[3]. The rock-types include pitchstones, quartz porphyries, normal diabase, quartzitic phases of the same rock, olivine-analcite varieties and sahlite diabases, all of which occur in sheets or dykes. The pitchstone presents no unusual characters. The quartz porphyries include those with a spherulitic groundmass and those whose groundmass is crystaline, and among the latter are microgranitic and micropegmantic varieties. The quartz-bearing diabases are usually in sheets. They contain large macroscopic quartzes and feldspars, especially near their contacts with the porphyry, and at their contacts with the underlying sandstone they contain large fragments of this rock. In the normal biabase both hypersthene and biotite occur. The large crystals of quartz and feldspar are regarded as foreign components, which have been caught up from the porphyry. The olivine analcite diabase is a typical diabase in which zeolites, and especially analcites, are abundant. These occupy the interstices be-

[3] Minn. u. Petrog. Mitth., XIV, p. 443.

tween the plagioclase and augites, and are thought to have originated from the alteration of nepheline.

Migration of Crystals from a Younger to an Older Rock.—It has long been assumed, that of two igneous rocks in contact, that containing crystals peculiar to the other was necessarily younger than the latter. Cole,[4] however, shows that crystals may be floated away into a pre-existing rock of a low degree of fusibility from one of a higher degree which has intruded it. At Glasdrumman Port, County Down, Ireland, a dyke of eurite is flanked on both sides by dykes of basaltic andesite, of which the andesites are unquestionably the older rocks, since the eurite on its contact with them encloses fragments torn from their sides. The eurite contains porphyritic crystals of pink orthoclase, while the andesite is normally devoid of them. Near its contact with the former rock, however, crystals exactly like those in the eurite are occasionally found in the andesite. Crystals of quartz and feldspar have also often been floated from the eurite into the detached fragments of the andesite. The invading rock has melted the groundmass of the andesite and has left its larger crystals scattered through a matrix made up largely of molten andesite intermingled with some eurite substance.

Notes.—In a report accompanying an excellent geological map of Essex Co., Mass., Sears[5] describes briefly the following rocks: Hornblende granitites, granophyric granitites with a flowage structure, augite-nepheline syenites, hornblende diorites, quartz-augite-diorites, muscovite-biotite-granites, norites, quartz porphyries, peridotites, gneisses, both igneous and clastic, bostonite and tinguaite dykes and various effusive rocks.

A series of chemical analyses of the gneissoid granites, granite porphyries and porphyrites of the Bachergebirge in Stiermark, has been made by Pontoni[6] in order to discover whether all the granite porphyries, that form great dyke masses in the region, have the same composition or not, and whether the small porphyrite dykes that cut the granite are like the granites and the granite porphyries or are unlike them. The conclusion reached is to the effect that the granite porphyries are identical with the gneissoid granites of the region, and that the porphyrites are independent intrusives.

[4] Scient. Trans. Roy. Dub. Soc., Vol. V, Ser. II, p. 239.
[5] Bull. Essex Inst., XXVI, 1894.
[6] Min. u. Petrog. Mitth., XIV, p. 360.

Zaleski[7] has made, with great care, a number of chemical analyses and mechanical separations of several granites to determine whether or not they are syenites plus quartz; that is, whether or not the chemical limits between which these rock types vary are fixed. His results may be tabulated as follows:

Locality.	SiO_2 Content.	SiO_2 of rock—Quartz.
Dannemora,	61.06	54.08
Nigg,	69.84	65.33
Hangö,	71.42	59.46
Baveno,	74.44	41.38

Of these granites only one possesses the silica content of syenite after the quartz has been abstracted from it.

Spurr,[8] in a bulletin on the iron-bearing rocks of the Mesabi Range in Minnesota, describes a series of fragmental and cherty rocks associated with the ores. One of these, to which he gives the name "taconite," consists of a groundmass of silica, in which are granites of a green substance, regarded by the author as glauconite. These are always more or less altered, yielding siderite, magnetite, hematite, etc. The sideritic phase of this taconite is like the original carbonate of Irving and Van Hise.

In a small collection of specimens from central and western Paraguay, Milch[9] has recognized quartzites, limestones and phonolites.

GEOLOGY AND PALEONTOLOGY.

Niagara and the Great Lakes.—Another contribution to the history of the Great Lakes is published by F. B. Taylor.[10] It is the eighth of a series and brings the history up to date. In an introduction the author refers to the recent papers of Professor J. W. Spencer and Mr. Warren Upham on the post-glacial history of the Great Lakes in the following language:—

"Prof. Spencer on the one hand levels all the higher abandoned beaches with the sea, and does not distinctly recognize a single ice-

[7] Ib., XIV, p. 342.
[8] Bull. No. X, Geol. and Nat. Hist. Survey of Minn.
[9] Min. u. Petrog. Mitth., XIV, p. 383.
[10] Amer. Journ. Sci. Arts, 1895.